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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,785	04/18/2005	Markus Muck	CR00570EP	3690

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EXAMINER	
CHAN, SAI MING	
ART UNIT	**PAPER NUMBER**
2616	

NOTIFICATION DATE	DELIVERY MODE
02/07/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/531,785	MUCK ET AL.	
	Examiner	Art Unit	
	Sai-Ming Chan	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/14/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *7* is/are withdrawn from consideration.

5)☒ Claim(s) *13* is/are allowed.

6)☒ Claim(s) *1-6,8-12 and 14-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date: _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

Claim 13 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Consider **claim 13,** the best prior art found during the examination of the present application, **Ahmed et al. (US Patent Publication #20020048333),** show and disclose the estimation of Channel Impulse Response as described.

However, Ahmed et al. do not specifically disclose the formula for bit stream demodulation.

Therefore claim 13 is considered novel and non-obvious.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ahmed et al. (U.S. Patent Publication # 20020048333),** in view of **Zhang (U.S. Patent # 6369758),** and in view of **Ho (U.S. Patent # 5495432),** and further in view of **Vobach (U.S. Patent # 5193115).**

Consider **claim 1, Ahmed et al.** and **claim 15, as applied to claim 1 above**, clearly disclose and show a method of communication using Orthogonal Frequency Division Multiplexing (`OFDM"), the method comprising the steps of:

generating bit streams b.sub.n.di-elect cons.(0,1),n=0,1, . . . ,K-1 and the corresponding sets of frequency domain carrier amplitudes (X.sub.0(k) to X.sub.N(k)) (paragraph 26 (superimpose several carrier-modulated waveforms to represent input bit stream)), where k is the OFDM symbol number, modulated as OFDM symbols to be transmitted from a transmitter (fig. 2, paragraph 26),

inserting prefixes as guard intervals (paragraph 27 (cyclic prefix generator)) in said sample streams,

transmitting said OFDM symbols from said transmitter to a receiver (paragraph 28),

using information from said prefixes to estimate the Channel Impulse Response (paragraph 29(shorten impulse response to less than the length of the prefix)) of the transmission channels at the receiver, and

using the estimated Channel Impulse Response (H.sub.D.sup.(F)) to demodulate said bit streams (paragraph 29) in the signals received at said receiver,

However, Ahmed et al. do not specifically disclose that prefixes are deterministic.

In the same field of endeavor, Zhang clearly shows said prefixes are deterministic (column 6, lines 40-64 (special signal patterns for training symbol)) and are known to said receiver (inherently taught in column 2, lines 64-67, column 3, lines 1-18 (receiver must know the training symbol in order to perform separation and then determine the weighting factor)) as well as to said transmitter (column 2, lines 64-67, column 3, lines 1-18 (training symbol with pseudo random subsymbol is transmitted))

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the deterministic prefix, as taught by Zhang, so that the prefix is known to the receiver.

However, Ahmed et al., as modified by Zhang, do not specifically disclose alpha.sub.k is a weighting factor proportional to e.sup.j.2.pi/N, where N is the useful OFDM symbol size.

In the same field of endeavor, Ho clearly shows e.sup.j.2.pi/N (column 6, lines 53-67)) is number of sample data.

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to demonstrate an OFDM communication system, as taught by Ahmed et al., and use the deterministic prefix in Ahmed's system, as taught by Zhang, and incorporate OFDM sysmbol size, as taught by Ho, so that prefixes are different.

However, Ahmed et al., as modified by Zhang and Ho, do not specifically disclose adding a pseudo-random prefix to N (i.e. N+D.sup.m).

In the same field of endeavor, Vobach clearly shows adding a pseudo-random prefix to N (i.e. N+D.sup.m) (column 10, lines 39-43 (altered string)) .

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to demonstrate an OFDM communication system, as taught by Ahmed et al., and use the deterministic prefix in Ahmed's system, as taught by Zhang, incorporate OFDM symbol size, as taught by Ho, and display altered prefix, as taught by Vobach, so that the energy of transmission is kept at the most efficient level.

Consider **claim 2,** and **as applied to claim 1 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose a common vector and a weighting factor in the prefixes.

In the same field of endeavor, Zhang clearly shows prefixes (.alpha..sub.kc.sub.0 to (.alpha..sub.kc.sub.D-1) (column 7, lines 57-67 (training symbol)) comprise a vector that is common to said symbols multiplied by at least one weighting factor (column 7, lines 57-67; column 8, lines 1-6 (y(t)=W.sup.H times X(i) where H.sup.H is a weight factor and X(i) is a vector).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the weighting factor, as taught by Zhang, so that the energy of transmission is kept at the most efficient level.

Consider **claim 3,** and **as applied to claim 2 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose different weighting factor.

In the same field of endeavor, Zhang clearly shows weighting factor (.alpha..sub.k) differs from one symbol to another (column 2, lines 46-63 (determine weight factor for each antenna)) but the elements of a given vector (P.sub.D) are multiplied by the same weighting factor (column 7, lines 57-67; column 8, lines 1-6 (y(t)=W.sup.H times X(i) where H.sup.H is a weight factor and X(i) is a vector).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the weighting factor, as taught by Zhang, so that the energy of transmission is kept at the most efficient level.

Consider **claim 4,** and **as applied to claim 3 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose pseudo-random value.

In the same field of endeavor, Zhang clearly shows weighting factor has a pseudo-random value (column 2, lines 29-45 (weighting factor is determined form pseudo random training symbol)).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the weighting factor, as taught by Zhang, so that the energy of transmission is kept at the most efficient level.

Consider **claim 5,** and **as applied to claim 1 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose complex weighting factor.

In the same field of endeavor, Zhang clearly shows weighting factor is a complex value (column 1, lines 61-67, column 2, lines 1-6 (complex weight factors)).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the weighting factor, as taught by Zhang, so that the energy of transmission is kept at the most efficient level.

Consider **claim 6,** and **as applied to claim 5 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose constant modulus for weighting factor.

In the same field of endeavor, Zhang clearly shows the modulus of said weighting factor is constant from one symbol to another (column 2, lines 19-28 (constant modulus in OFDM symbols)).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the constant modulus in weighting factor, as taught by Zhang, so that the energy of transmission is kept at the most efficient level.

Claims 8-12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ahmed et al. (U.S. Patent Publication # 20020048333),** in view of **Zhang (U.S. Patent # 6369758),** in view of **Ho (U.S. Patent # 5495432),** and in view of **Vobach (U.S. Patent # 5193115),** and further in view of **Laroia et al. (U.S. Patent Publication # 20020044524).**

Consider **claim 8,** and **as applied to claim 1 above,**

claim 12, and as applied to claim 1 above,

claim 16, and as applied to claim 1 above,

Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show the method as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose estimating the Channel Impulse Response.

In the same field of endeavor, Laroia et al. clearly shows a method, wherein estimating said Channel Impulse Response (H(F)/D) (fig. 1(114); paragraph 8, lines 12-21) comprises performing a Fourier Transform (fig. 1(110); paragraph 8 (FFT converts signal from time domain to frequency domain)) on a first vector (V.sub.HP) that comprises the received signal components corresponding to one of said prefixes (.alpha..sub.k+1c.sub.0 to .alpha..sub.k1c.sub.D-1) (fig.1 (110);paragraph 8, lines 1-12 (transmitted symbols at 106 contains the signals from different channels, each of which

carries prefix and data)) and also the received signal components corresponding to the following one of said prefixes to produce a received prefix signal transform (V.sub.HP, F.), perform a similar Fourier transform on a second vector (V.sub.p) (fig. 1(110); paragraph 8 (FFT transforms signal from time domain to frequency domain)) that comprises the known values of corresponding components of said prefixes (.alpha..sub.kc.sub.0 to .alpha..sub.kc.sub.D-1, .alpha..sub.k+1c.sub.0 to .alpha..sub.k+1c.sub.D-1) to produce a known prefix transform (V.sub.P,F), and performing a component-by-component division of the receiving prefix signal transform (V.sub.HP,F) by known prefix transform (V.sub.P,F) (fig. 1(110); paragraph 8 (FFT transforms signal from time domain to frequency domain)).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the Channel Impulse Response estimation, as taught by Laroia et al., so that the energy of transmission is kept at the most efficient level.

Consider **claim 9,** and **as applied to claim 8 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication s, wherein said prefixes comprise a vector (P.sub.D) that is common to said symbols multiplied by weighting factors (.alpha..sub.k, .alpha..sub.k+1), said weighting factors differing from one symbol to another but the elements of a given vector being multiplied by the same weighting factor, and wherein the received signal components

corresponding to said one of said prefixes (.alpha..sub.kc.sub.0 to .alpha..sub.kc.sub.D-1) and said following one of said prefixes (.alpha..sub.k+1c.sub.0 to .alpha..sub.k+1c.sub.D-) are weighted by the respective value of said weighting factor (.alpha..sub.k, .alpha..sub.k+1) before summing and performing said Fourier Transform to produce said received prefix signal transform (V.sub.HP,F) (inherently in fig. 1 (110) and paragraph (paragraph 7 (FFT or DFT circuit perform a Fourier transformation on the resultant signal to generate a transformed resultant signal vector)).

Consider **claim 10,** and **as applied to claim 8 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication, wherein said Fourier Transforms are of dimension D.times.D, where D is the size of said prefixes (c.sub.0.alpha..sub.k to C.sub.D-1.alpha..sub.k) (inherently in fig. 1 (110) and paragraph (paragraph 7 (D prefixes will mean D vectors. Therefore the Fourier transformation will have D * D dimension)).

Consider **claim 11,** and **as applied to claim 8 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication, wherein said Fourier Transforms are of dimension (D+N).times.(D+N), where D is the size of said prefixes (.alpha..sub.kc.sub.0 to .alpha..sub.kc.sub.D-1) and N is the size of the OFDM signals between said prefixes, said first vector (V.sub.HP) comprises said sum of said received signal components corresponding to one of said prefixes

(.alpha..sub.kc.sub.0 to .alpha..sub.kc.sub.D-1) and of the following one of said prefixes (.alpha..sub.k+1c.sub.0 to .alpha..sub.k+1c.sub.D-1) augmented by a zero value vector (0.sub.N.sup.T) of size (N) to produce said received prefix signal transform (V.sub.HP,F) of size (N+D), and said second vector (V.sub.P) comprises said known components of said prefixes ((.alpha..sub.kc.sub.0 to .alpha..sub.kc.sub.D-1, .alpha..sub.k+1c.sub.0 to .alpha..sub.k+1c.sub.D-1) augmented by said zero value vector (0.sub.N.sup.T) of size (N) to produce said known prefix transform (V.sub.P,F) of size (N+D) (inherently taught in fig. 1 (110) and paragraph (paragraph 7 (FFT or DFT circuit perform a Fourier transformation on the resultant signal to generate a transformed resultant signal vector)).

Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ahmed et al. (U.S. Patent Publication # 20020048333),** in view of **Zhang (U.S. Patent # 6369758),** in view of **Ho (U.S. Patent # 5495432),** and in view of **Vobach (U.S. Patent # 5193115),** and further in view of **Raleigh et al. (U.S. Patent Publication # 20030072382).**

Consider **claim 14,** and **as applied to claim 3 above,** Ahmed et al., as modified by Zhang, Ho and Vobach, clearly disclose and show a method of communication as described.

However, Ahmed et al., as modified by Zhang, Ho and Vobach, do not specifically disclose using padded zeros.

In the same field of endeavor, Raleigh et al. clearly show a method of communication s, wherein demodulating said bit streams includes padding the received signal matrix and the operator matrices with zeros (paragraph 230 (padded with zeros)) to obtain compatible dimensions for subsequent operations, multiplying the known prefix value matrix by the Channel Impulse Response estimation matrix and subtracting the result from the received signal matrix.

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate an OFDM communication system, as taught by Ahmed et al., and demonstrate the use of padded zeros in Channel Impulse Response estimation, as taught by Raleigh et al., so that the energy of transmission is kept at the most efficient level.

Response to Amendment

Applicant's arguments filed on November 14, 2007, with respect to claim 1, on page 1 and through page 2 of the remarks, have been fully considered but they are moot in view of the new ground(s) of rejection necessitated by the new limitations added to claim 1. See the above rejection of claim 1 for the relevant interpretation and citations

found in Ho and Vobach, disclosing the newly added limitations.

Conclusion

Any response to this Office Action should be **faxed to** (571) 273-8300 **or mailed to**:

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Hand-delivered responses should be brought to

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Any inquiry concerning this communication or earlier communications from the

Examiner should be directed to Sai-Ming Chan whose telephone number is (571) 270-1769. The Examiner can normally be reached on Monday-Thursday from 6:30am to 5:00pm.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 571-272-4100.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

Seema S. Rao 2/4/08
SEEMA S. RAO
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TECHNOLOGY CENTER 2600

Sai-Ming Chan
S.C./ sc

February 2, 2007